



## ACAT1 gene

acetyl-CoA acetyltransferase 1

### Normal Function

The *ACAT1* gene provides instructions for making an enzyme that is found in the energy-producing centers within cells (mitochondria). This enzyme plays an essential role in breaking down proteins and fats from the diet. Specifically, it helps process isoleucine, an amino acid that is a building block of many proteins. This enzyme is also involved in processing ketones, which are molecules that are produced when fats are broken down in the body.

During the breakdown of proteins, the ACAT1 enzyme is responsible for the last step in processing isoleucine. It converts a molecule called 2-methyl-acetoacetyl-CoA into two smaller molecules, propionyl-CoA and acetyl-CoA, that can be used to produce energy.

The ACAT1 enzyme carries out the last step in ketone breakdown (ketolysis) during the processing of fats. The enzyme converts a molecule called acetoacetyl-CoA into two molecules of acetyl-CoA, which can be used to produce energy. In the liver, the enzyme also carries out this chemical reaction in reverse, which is the first step in building new ketones (ketogenesis).

### Health Conditions Related to Genetic Changes

#### beta-ketothiolase deficiency

More than 40 mutations in the *ACAT1* gene have been identified in people with beta-ketothiolase deficiency. Some of these genetic changes disrupt the normal function of the enzyme, while other mutations prevent cells from producing any functional enzyme.

A shortage of the ACAT1 enzyme prevents the body from processing proteins and fats properly. As a result, chemical byproducts called organic acids can build up to toxic levels in the blood. These substances cause the blood to become too acidic (ketoacidosis), which can damage the body's tissues and organs, particularly in the nervous system. This damage leads to episodes of vomiting, dehydration, and other health problems associated with beta-ketothiolase deficiency.

Cytogenetic Location: 11q22.3, which is the long (q) arm of chromosome 11 at position 22.3

- ACAT
- acetoacetyl Coenzyme A thiolase
- acetyl-Coenzyme A acetyltransferase 1
- acetyl-Coenzyme A acetyltransferase 1 (acetoacetyl Coenzyme A thiolase)
- acetyl-Coenzyme A acetyltransferase 1 precursor
- MAT
- T2
- THIL
- THIL\_HUMAN

- Basic Neurochemistry (sixth edition, 1998): Beta-ketothiolase deficiency syndrome is caused by defects in 2-methylacetoacetyl-CoA thiolase, which mediates the conversion of 2-methylacetoacetyl-CoA to acetyl-CoA and propionyl-CoA  
<https://www.ncbi.nlm.nih.gov/books/NBK27945/#A3113>

- GTR: Genetic tests for ACAT1  
<https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=38%5Bgeneid%5D>

## Scientific Articles on PubMed

- PubMed  
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28ACAT1%5BTIAB%5D%29+OR+%28acetyl-Coenzyme+A+acetyltransferase+1%5BTIAB%5D%29+OR+%28acetoacetyl+Coenzyme+A+thiolase%5BTIAB%5D%29%29+AND+english%5BIa%5D+AND+human%5Bmh%5D>

## OMIM

- ACETYL-CoA ACETYLTRANSFERASE 1  
<http://omim.org/entry/607809>

## Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology  
[http://atlasgeneticsoncology.org/Genes/GC\\_ACAT1.html](http://atlasgeneticsoncology.org/Genes/GC_ACAT1.html)
- ClinVar  
<https://www.ncbi.nlm.nih.gov/clinvar?term=ACAT1%5Bgene%5D>
- HGNC Gene Symbol Report  
[http://www.genenames.org/cgi-bin/gene\\_symbol\\_report?q=data/hgnc\\_data.php&hgnc\\_id=93](http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=93)
- NCBI Gene  
<https://www.ncbi.nlm.nih.gov/gene/38>
- UniProt  
<http://www.uniprot.org/uniprot/P24752>

## **Sources for This Summary**

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- Korman SH. Inborn errors of isoleucine degradation: a review. Mol Genet Metab. 2006 Dec;89(4): 289-99. Epub 2006 Sep 6. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/16950638>
  - Zhang GX, Fukao T, Rolland MO, Zobot MT, Renom G, Touma E, Kondo M, Matsuo N, Kondo N. Mitochondrial acetoacetyl-CoA thiolase (T2) deficiency: T2-deficient patients with "mild" mutation(s) were previously misinterpreted as normal by the coupled assay with tiglyl-CoA. Pediatr Res. 2004 Jul;56(1):60-4. Epub 2004 May 5.  
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